Project Fact Sheet

Research, Develop and Demonstrate 12.5 kW Small Modular Biopower System

GOALS

- Improve environmental and public health costs/risk of California's electricity by mitigating air quality impacts and reducing environmental risks. If successful, this technology will provide beneficial means of forest residue disposal, reduce wildfires, and reduce air pollution from in-forest burning of slash; and
- Improve the reliability/quality of California's electricity by removing barriers to distributed generation technology.

PROJECT DESCRIPTION

The purpose of this project is to design, develop and demonstrate a stand-alone, small modular biopower (SMB) system rated at 12.5 kW for a distributed generation application providing both electricity and heat using two different types of forest residue.

This project is Phase II of an SMB initiative co-funded by the National Renewable Energy Laboratory (NREL)/US Department of Energy (US DOE). In this Phase, the Contractor shall design, fabricate and test two SMB systems; namely NREL SMB and PIER SMB. The NREL SMB project is funded by NREL/US DOE and Shell International Renewables, Ltd. for a rural electrification project in the Philippines. The PIER SMB is funded by PIER and co-funded by NREL/US DOE. The Contractor shall design, fabricate and test PIER SMB, based on lessons learned in NREL SMB, for combined power and heat application at Tsemeta Forest Regeneration Complex, Hoopa, California. Phase I of the SMB initiative is a feasibility stage, completed and funded mainly by NREL/US DOE and not PIER funds.

The overall technical objective of this project is to develop and demonstrate a 12.5 kW small modular biopower system in a displaced retail, combined heat and power application, and collect the data needed to develop the scale-up path to a family of commercially viable systems in California.

The specific technical objectives are:

- Provide up to 12.5 kilowatt electric (kWe) and 20 kilowatt thermal (kWt) power to the proposed on-site load
- Provide 220 volts, 3 phase power for the proposed load in parallel with the grid
- Operate with no more than one operator
- Provide 12.5 kWe power using two of the following feedstocks: Oak, Alder, Madrone and/or Douglass Fir
- Achieve combined heat and power efficiencies of greater than 60 percent. Electrical efficiency to be no less than18,000 Btu/kWh (higher heating value (HHV))
- At peak power of 12.5kWe,the small modular biomass (SMB) system will meet or exceed California's emission standards for a 4 cylinder automobile internal combustion engine.

Proposed Economic Outcomes: The overall economic objective of this project is to achieve competitive financial performance for a family of distributed generation applications of the SMB system, both on-grid and off-grid. The specific, cost objectives for are (assumes the global sales of SMB system of 1000 units a year):

- 12 kW (grid-connected and off-grid)
- capital cost of $1,000 per kW
- electricity cost of less than 15 cents per kWh
- heat cost less than $1.20 per therm

BENEFITS TO CALIFORNIA

This project provides the following benefits to California:

- providing beneficial means of disposal of forest residue
- reducing energy costs
- improving air quality
- improving power quality
- removing barriers to distributed generation

FUNDING AMOUNT

Commission $645,827 Match $609,695 Total $1,255,522

PROJECT STATUS

The project kick-off meeting was held at Hoopa Valley on November 1, 2000.

The work related to shakedown testing of the first small modular biopower system developed under Phase 2 contract with NREL was completed. Endurance runs at CPC generated 1 MWh of electricity and 145 hours of operation. The unit was shipped to the Philippines in February 2001, and was installed and commissioned on April 2001 in Alaminos, Philippines. Field endurance testing from this unit was used for the PIER-SMB unit.

The SMB system was built, installed and tested at the Hoopa Forest Regeneration Complex. Modifications were performed to test the system for combined heat and power. A heat exchanger has been fabricated and installed on the PIER-SMB to collect waste heat and deliver hot water to the greenhouse. The PIER-SMB was grid connected and the performance was tested to meet the contract requirements.

FOR MORE INFORMATION

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